

B<sup>1</sup> 1. (twice amended) A clay-polymer nanocomposite comprising an organoclay which has been exfoliated into a polymer matrix, the organoclay being the reaction product of a smectite clay with a quaternary onium compound mixture, wherein the quaternary onium compound mixture comprises a diester quaternary ammonium compound mixed with an additional quaternary ammonium compound, wherein the additional quaternary ammonium compound <sup>is</sup> ~~comprises~~ a triester quaternary ammonium compound, a monoester quaternary ammonium compound, or mixtures thereof.

B<sup>2</sup> 8<sup>10</sup> (twice amended) An organoclay comprising the reaction product of a smectite clay with a quaternary onium compound mixture wherein the quaternary onium compound mixture comprises a diester quaternary ammonium compound mixed with an additional quaternary ammonium compound, wherein the additional quaternary ammonium compound <sup>is</sup> ~~comprises~~ a triester quaternary ammonium compound, a monoester quaternary ammonium compound, or mixtures thereof.

B<sup>3</sup> 11<sup>8</sup> (twice amended) The organoclay composition of claim ~~10~~<sup>8</sup>, wherein the fatty acids corresponding to the esters in the quaternary onium compound mixture for the quaternary ammonium compounds have a degree of unsaturation such that the iodine value ("IV") is from about 20 to about 90.

B<sup>4</sup> 17<sup>31</sup> (amended) A method for preparing a nanocomposite comprising:  
  
contacting a smectite clay with a quaternary onium compound mixture comprising a diester quaternary ammonium compound mixed with an additional quaternary ammonium compound, wherein the additional quaternary ammonium compound <sup>is</sup> ~~comprises~~ a triester

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cont. quaternary ammonium compound, a monoester quaternary ammonium compound, or mixtures thereof; and

intermixing an organoclay with a polymer matrix.

B5 20 36. (amended) 17. The method of claim 31, wherein the fatty acids corresponding to the esters in the quaternary ammonium compound mixture for the quaternary ammonium compounds have a degree of unsaturation such that the iodine value ("IV") is from about 20 to about 90.

Please add the following claims:

B6 27 46. The nanocomposite of claim 1, wherein the diester quaternary ammonium compound, triester quaternary ammonium compound, and monoester quaternary ammonium compound are the reaction products of C<sub>12</sub>-C<sub>22</sub> fatty acids or the hydrogenation products thereof, or a mixture of such acids, with an alkanolamine in the presence of an acid catalyst wherein the ratio of fatty acid to alkanolamine is from about 1.40 to 2.0.

28 46. 8. The organoclay of claim 10, wherein the diester quaternary ammonium compound, triester quaternary ammonium compound, and monoester quaternary ammonium compound are the reaction products of C<sub>12</sub>-C<sub>22</sub> fatty acids or the hydrogenation products thereof, or a mixture of such acids, with an alkanolamine in the presence of an acid catalyst wherein the ratio of fatty acid to alkanolamine is from about 1.40 to 2.0.

29 47. 17. The method of claim 31, wherein the diester quaternary ammonium compound, triester quaternary ammonium compound, and monoester quaternary ammonium compound are the reaction products of C<sub>12</sub>-C<sub>22</sub> fatty acids or the hydrogenation products thereof, or a mixture of such acids, with an alkanolamine in the presence of an acid catalyst wherein the ratio of fatty

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acid to alkanolamine is from about 1.40 to 2.0.

**Response to Office Action Mailed February 21, 2001**

**A. Claims In The Case**

Claims 1, 4-10, 12-20 and 31-44 have been rejected. Claims 14, 34 and 42-44 have been canceled without prejudice. Claims 45-47 have been added. Claims 1, 4-10, 12, 13, 15-20, 31-33, 35-41, and 45-47 are pending in the application.

**B. The Claims Contain Subject Matter Described In The Specification Pursuant To 35 U.S.C. § 112, First Paragraph**

Claims 1-20 and 31-44 were rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicant respectfully disagrees with this rejection; however, to expedite the case Applicant has amended the claims for clarification.

**C. The Claims Are Not Indefinite Pursuant To 35 U.S.C. § 112, Second Paragraph**

Claim 1 was rejected under 35 U.S.C. § 112, second paragraph, as containing improper Markush language. Claims 1, 10 and 31 have been amended for clarification.

**D. The Claims Are Not Obvious By The Cited Art Pursuant To 35 U.S.C. § 103(a)**

Claims 1, 4-10, 12-20 and 31-44 were rejected as being unpatentable over WO 93/04117 to Maxfield ("Maxfield") in view of U.S. Patent No. 6,037,315 to Franklin ("Franklin").

To establish a *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP § 2143.03. Further, hindsight combination of components may not be utilized to establish obviousness. *In re ATD Corporation v. Lydall, Inc.*, 48 USPQ 2d 1321, 1329 (Fed. Cir. 1998).

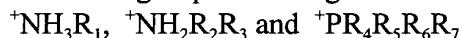
Applicant's amended claim 1 states:

A clay-polymer nanocomposite comprising an organoclay which has been exfoliated into a polymer matrix, the organoclay being the reaction product of a smectite clay with a quaternary onium compound mixture, wherein the quaternary onium compound mixture comprises a diester quaternary ammonium compound mixed with an additional quaternary ammonium compound, wherein the additional quaternary ammonium compound comprises a triester quaternary ammonium compound, a monoester quaternary ammonium compound, or mixtures thereof.

Maxfield does not appear to teach all the features in claim 1, including an organoclay that is the "reaction product of a smectite clay with a quaternary onium compound mixture, wherein the quaternary onium compound mixture comprises a diester quaternary ammonium compound mixed with an additional quaternary ammonium compound, wherein the additional quaternary ammonium compound is a triester quaternary ammonium compound, a monoester quaternary ammonium compound, or mixtures thereof."

Maxfield states:

The effective swelling/compatibilizing agent of this invention is selected from the group consisting of cations of the formulas:



wherein:

$\text{R}_1$  is an organic radical having at least about 12 aliphatic carbon atoms;  $\text{R}_2$  and  $\text{R}_3$  are the same or different and are organic radicals having at least about 5 carbon atoms; and  $\text{R}_4$ ,  $\text{R}_5$ ,  $\text{R}_6$  and  $\text{R}_7$  are the same or different and are organic radicals of which at least one has about 8 aliphatic carbon atoms.

(Page 12, line 31 to Page 13, line 7)

Maxfield does not appear to teach or suggest the use of the diester, triester, or monoester quaternary ammonium compounds disclosed in the claims. Maxfield does not appear to teach or suggest the use of esterified ammonium cations. The Examiner concurs stating, "The difference between the present invention and the prior art of Maxfield is showing of a particular ammonium compound which can be utilized in organoclays."

With regard to the particular organoclay compounds, the Examiner relies on Franklin to overcome the deficiencies of Maxfield. The Examiner states "the quaternary ammonium compound of Franklin is a mixture of mono-, di- and triesters." Applicant submits that Franklin teaches the same compounds disclosed in Applicants patent application. Specifically, both Applicant's claims and Franklin teach the use of esterified **quaternary** ammonium compounds. Neither Franklin nor applicants claims are related to primary or secondary ammonium compounds as disclosed in Maxfield.

Maxfield teaches the importance of using primary or secondary ammonium compounds over tertiary or quaternary ammonium compounds. For example, Maxfield states:

Another advantage results from the fact that the swelling/compatibilizing agents used in this invention are

secondary and primary ammonium and quaternary phosphonium cation complexes containing specific number of aliphatic carbon atoms. Use of these swelling/compatibilizing agents provides for several advantages over other process (sic) where the swelling/compatibilizing agents are tertiary and quaternary ammonium cation complexes, and secondary and primary ammonium and quaternary phosphonium cation complexes containing less than the required number of aliphatic carbon atoms. For example, the specific swelling/compatibilizing agents of this invention cover the layers of the layered materials to render their surfaces more organophilic than those compatibilized by tertiary and quaternary ammonium cation complexes and those compatibilized with secondary and primary ammonium cation complexes and quaternary phosphonium cation complexes having less than the required number of aliphatic carbon atoms. The specific swelling/compatibilizing agents of this invention facilitate exfoliation of the layered material into plate particles in the polymer melt employing reduced shear mixing resulting in less decomposition of the polymer and reduction in molecular weight. (Maxfield, Page 4, lines 6-30)

Applicant submits that Maxfield clearly teaches away from the use of any quaternary ammonium compound. As such, Applicant submits that the Examiner's combination of Franklin with Maxfield is improper. Teaching away from art is a *per se* demonstration of lack of obviousness. *In re Dow Chemical Co.*, 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988); *In re Fine*, 837, F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Maxfield further states:

The specific swelling/compatibilizing agents of this invention are more heat stable than other cationic swelling/compatibilizing agents such as tertiary and quaternary ammonium cation complexes and secondary and primary ammonium and quaternary phosphonium cationic complexes having less than the specified number of aliphatic carbon atoms. The result is that the swelling/compatibilizing agents of this invention do not substantially decompose at melt processing temperatures equal to

or greater than about 220° C into lower molecular weight materials which degrade polymers in the matrix or which are hazardous, either as vapors evolved during melt processing, or in articles such as films in food and drug packing.  
(Page 4, line 30 to Page 5, line 7)

Maxfield appears to teach that the use of quaternary ammonium compounds, such as the compounds recited in Applicant's claims, would be unfavorable for high heat applications. An obviousness rejection based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, is not proper and the case of obviousness cannot be properly made. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

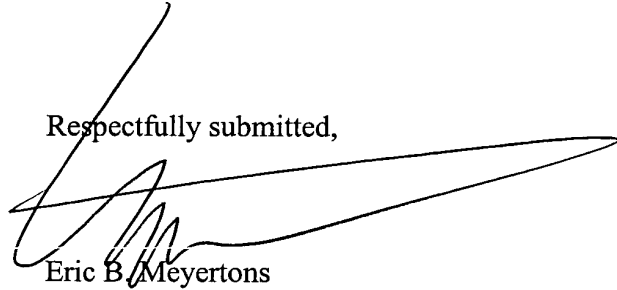
For at least the same reasons cited above with regard to Maxfield and Franklin, Applicant submits that Maxfield in view of Franklin does not teach all of the features of claims 10 and 31.

**E. Summary**

Based on the above, Applicant submits that all claims are now in condition for allowance. Favorable reconsideration is respectfully requested.

Applicant respectfully requests a one month extension of time to respond to the Office Action dated February 21, 2001. A Fee Authorization form in the amount of \$55.00 is enclosed for the extension of time fee. If any further extension of time is required, Applicant hereby requests the appropriate extension of time. If any fees are inadvertently omitted or if any additional fees are required or have been overpaid, please appropriately charge or credit those fees to Conley, Rose & Tayon, P.C. Deposit Account Number 50-1505/5628-00400/EBM

Respectfully submitted,



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